APPENDIX A - CLAIM AMENDMENTS

Serial No.: 10/014,846
Docket No.: 22163-3001
(Former Docket No.: 85058-202 ADB)

Claims 1-39 (Cancelled)

Claim 40 (Currently amended): A probe for use in effecting treatment in a patient comprising:
a heat source for applying heat to a volume within the patient;

a probe body mounting the heat source thereon for allowing invasive insertion of an end of the probe into the patient;

a supply duct on the probe body for a cooling fluid extending from a supply to the end of the probe;

the probe body being arranged to provide an expansion zone of reduced pressure at the end of the probe body so as to cause the cooling fluid to expand as a gas thus generating a cooling effect; and

a return duct on the probe body for return of the expanded gas from the end of the probe,

wherein the return duct is between 200 and 250 times ~~of~~ larger in cross-sectional area than the supply duct.[[.]]

Claim 41 (Original): The probe according to claim 40 wherein the temperature of the probe is cooled to a temperature in the range of about zero to about minus 20 degrees Celsius.

Claim 42 (Cancelled)

Claim 43 (Cancelled)

Claim 44 (Original): The probe according to claim 40 wherein the probe body comprises an outer tube, wherein the supply duct is arranged inside the outer tube and wherein the return duct is defined by an inside surface of the outer tube.

Claim 45 (Original): The probe according to claim 44 wherein the supply duct is attached to an inside surface of the outer tube.

Claim 46 (Original): The probe according to claim 44 wherein the outer tube includes a heat energy supply conduit for transporting the heat energy from a supply to the end of the probe and wherein the heat energy supply conduit is attached to the inside surface of the outer tube.

Claim 47 (Original): The probe according to claim 40 wherein the cooling fluid is a gas that is expanded through a restricting orifice.

Claim 48 (Original): The probe according to claim 47 wherein the supply duct comprises a supply tube and the restricting orifice is formed by a reduced necking of the supply tube at an end thereof at the expansion zone.

Claim 49 (Original): The probe according to claim 40 wherein the probe body comprises an outer tube and the supply duct is mounted within the outer tube with the end thereof including the necking extending beyond an end of the outer tube.

Claim 50 (Original): The probe according to claim 40 wherein the heat source comprises a laser, an optical fiber for communicating light from the laser, and a light directing element at an end of the fiber, wherein the light directing element comprises a chamfered end of the fiber and wherein the chamfered end is located in the gas in the expansion zone.

Claim 51 (Original): The probe according to claim 50 wherein the chamfered end is arranged at 45 degrees.

Claim 52 (Original): The probe according to claim 50 wherein the chamfered end carries a coating arranged to reflect light at two different wavelengths.

Claim 53 (Previously presented): The probe according to claim 40 wherein there is provided a temperature sensor at the end of the probe.

Claim 54 (Previously presented): The probe according to claim 40 wherein the probe body comprises an outer tube and there is provided a temperature sensor mounted on the inside surface of the outer tube at the end of the probe.

Claim 55 (Previously presented): The probe according to claim 40 wherein the temperature at the end of the probe is controlled by varying the pressure in the cooling fluid as supplied through the supply duct.

Claim 56 (Previously presented): The probe according to claim 40 wherein the heat source comprises a laser and an optical fiber for communicating light from the laser to the end of the probe, and wherein the probe includes an outer tube and a transparent capsule enclosing an end of the outer tube with the fiber extending to a position beyond the end of the outer tube into the capsule.

Claim 57 (Previously presented): A method for effecting treatment in a patient comprising:

identifying a volume in the patient the whole of which volume is to be heated to a required temperature, the volume being defined by a peripheral surface of the volume;

heating the volume within the patient by:

inserting a probe having a longitudinal axis and a distal end into the patient such that the distal end is in the volume;

sending laser energy through the probe;

deflecting the laser energy from the distal end of the probe at an angle from the longitudinal angle greater than zero, such that a heating effect of the probe lies in a disk-shaped area surrounding the axis;

directing the heat to define a heating zone that forms a limited angular orientation of heating within the disk-shaped area such that as the probe is rotated, the probe causes heating of different angular segments of the volume within the disk-shaped area;

with the probe at a fixed axial position, rotating the probe about the axis so that the heating zone lies in a selected segment;

wherein applying heat to the selected segment causes heat to be transferred from the segment into parts of the volume outside the segment surrounding the end of the probe; and

cooling the end of the probe so as to extract heat from the parts surrounding the probe by conduction of heat therefrom

wherein cooling the distal end of the probe so as to extract heat from the parts surrounding the probe by conduction of heat therefrom comprises:

directing fluid to the distal end of the probe through a supply duct in the probe;

vaporizing the fluid in an expansion zone of reduced pressure in the distal end of the probe;

retrieving the gas from the probe through a return duct in the probe that is between 200 and 250 times larger in cross-sectional area than the supply duct.

Claim 58 (Previously presented): The method of claim 57 wherein cooling the end of the probe so as to extract heat from the parts surrounding the probe by conduction of heat therefrom comprises cooling the end of the probe sufficiently to prevent the end of the probe from heating tissue outside of the selected segment to the required temperature.

Claim 59 (Previously presented): The method of claim 58 wherein cooling the end of the probe sufficiently to prevent the end of the probe from heating tissue outside of the selected segment to the required temperature comprises cooling the end of the probe sufficiently to prevent the end of the probe from coagulating tissue outside of the segment.

Claim 60 (Previously presented): The method of claim 57 further comprising moving the end of the probe axially within the volume thereby moving the disk-shaped area axially within the volume from a first position to a second position.

Claim 61 (Previously presented): The method of claim 57 further comprising operating a non-invasive detection system to monitor a series of temperatures of the peripheral surface of the volume for use as a factor in determining when to stop heating a segment.

Claim 62 (Previously presented): The method of claim 57 wherein sending laser energy through the probe comprises sending laser energy through an optical fiber contained within the probe and wherein deflecting the laser energy from the distal end of the probe at an angle from the longitudinal angle greater than zero comprises deflecting the laser energy off of a light directing element proximate the distal end of the fiber.

Claim 63 (Cancelled)

Claim 64 (Previously presented): The method of claim 57 further comprising controlling a flow rate of the fluid directed to the distal end such that the distal end of the probe is cooled to a temperature between zero and minus 20 degrees Celsius.

Claim 65 (Cancelled)

Claim 66 (Previously presented): The method of claim 57 wherein sending laser energy through the probe comprises sending laser energy through the probe at a power level that decreases from an initial high level to a lower value for each segment heated.

Claim 67 (Previously presented): The method of claim 57 wherein retrieving the gas from the probe through a return duct in the probe comprises retrieving the gas from the probe through a return duct having outward extents defined by inside surfaces of an outer wall of the probe.

Claim 68 (Previously presented): The method of claim 67 wherein directing fluid to the distal end of the probe through a supply duct in the probe comprises directing fluid to the distal end of the probe through a supply duct defined by a tube attached to the inside surface of the outer wall of the probe.

Claim 69 (Previously presented): The method of claim 67 wherein sending laser energy through the probe comprises sending laser energy through a medium attached to the inside surface of the outer wall of the probe.

Claim 70 (Previously presented): The method of claim 57 wherein vaporizing the fluid in an expansion zone of reduced pressure in the distal end of the probe comprises passing the fluid through a restricting orifice at an end of the supply duct leading into the expansion zone.

Claim 71 (Previously presented): The method according to claim 70 wherein passing the fluid through a restricting orifice at an end of the supply duct leading into the expansion zone comprises passing the fluid through a restricting orifice formed by a reduced necking of a tube defining the supply duct.

Claim 72 (Previously presented): The method according to claim 71 wherein passing the fluid through a restricting orifice formed by a reduced necking of a tube defining the supply duct comprises passing the fluid through a restricting orifice disposed distally of an end of an outer tube that defines the return duct.

Claim 73 (Previously presented): The method according to claim 57 wherein sending laser energy through the probe comprises sending laser energy through an optical fiber contained within the probe and wherein deflecting the laser energy from the distal end of the probe at an angle from the longitudinal angle greater than zero comprises deflecting the laser energy off of a chamfered end of the optical fiber located in the expansion zone.

Claim 74 (Previously presented): The method according to claim 73 wherein deflecting the laser energy off of a chamfered end of the optical fiber located in the expansion zone comprises deflecting the laser energy off of a chamfered end of the optical fiber that is chamfered at approximately 45 degrees to the longitudinal axis of the probe.

Claim 75 (Previously presented): The method according to claim 73 wherein deflecting the laser energy off of a chamfered end of the optical fiber located in the expansion zone comprises deflecting the laser energy off of a chamfered end of the optical fiber having a coating that reflects light at two different wavelengths.

Claim 76 (Previously presented): The method of claim 57 further comprising receiving data from a temperature sensor located at the distal end of the probe.

Claim 77 (Previously presented): The method of claim 68 further comprising receiving data from a temperature sensor mounted on the inside surface of the outer wall of the probe proximate the distal end.

Claim 78 (Previously presented): The method of claim 57 further comprising controlling a temperature at the distal end of the probe by varying the pressure of the fluid directed to the distal end of the probe.

Claim 79 (Currently amended): A method for effecting treatment in a patient comprising:

identifying a volume in the patient to be heated to a required temperature;

inserting a distal end of a probe into the volume using a position control system;

heating the volume by directing energy out the distal end of the probe into the volume; and

cooling the distal end of the probe by:

directing cooling fluid to an expansion zone in the distal end of the probe through a supply duct defined by the probe;

allowing the cooling fluid to undergo a phase change to gas in the expansion zone; and

retrieving the gas through a return duct defined by the probe, wherein the return duct is between 200 and 250 times ~~has a~~ larger in cross-sectional area than the supply duct.[[.]]

Claim 80 (Previously presented): The method of claim 79 wherein cooling the distal end of the probe comprises cooling the distal end of the probe to between zero and minus 20 degrees Celsius.

Claim 81 (Cancelled)

Claim 82 (Cancelled

Claim 83 (Previously presented): The method of claim 79 wherein retrieving the gas through a return duct defined by the probe comprises retrieving the gas from the probe through a return duct having outward extents defined by inside surfaces of an outer wall of the probe.

Claim 84 (Previously presented): The method of claim 83 wherein directing cooling fluid to an expansion zone in the distal end of the probe through a supply duct defined by the probe comprises directing fluid to the expansion zone in the distal end of the probe through a supply duct defined by a tube attached to the inside surface of the outer wall of the probe.

Claim 85 (Previously presented): The method of claim 83 wherein heating the volume by directing energy out the distal end of the probe into the volume comprises sending energy through an energy supply conduit attached to the inside surface of the outer wall of the probe.

Claim 86 (Previously presented): The method of claim 79 wherein allowing the cooling fluid to undergo a phase change to gas in the expansion zone comprises passing the cooling fluid through a restricting orifice at a distal end of the supply duct.

Claim 87 (Previously presented): The method of claim 86 wherein passing the cooling fluid through a restricting orifice at a distal end of the supply duct comprises passing the cooling fluid through a restricting orifice at a distal end of the supply duct formed by a reduced necking of a tube defining the supply duct.

Claim 88 (Previously presented): The method of claim 87 wherein directing cooling fluid to an expansion zone in the distal end of the probe through a supply duct defined by the probe comprises directing fluid to the distal end of the probe through a supply duct defined by a tube attached to an inside surface of an outer wall of the probe.

Claim 89 (Previously presented): A method for effecting treatment in a patient comprising:

identifying a volume in the patient to be heated to a required temperature;

inserting a distal end of a probe into the volume using a position control system;

heating the volume by directing energy out the distal end of the probe into the volume; and

cooling the distal end of the probe by

directing cooling fluid to an expansion zone in the distal end of the probe through a supply duct defined by the probe;

allowing the cooling fluid to undergo a phase change to gas in the expansion zone; and

retrieving the gas through a return duct defined by the probe wherein heating the volume by directing energy out the distal end of the probe into the volume comprises directing laser energy through an optical fiber contained within the probe and deflecting the laser energy off of a chamfered end of the optical fiber located in the expansion zone.

Claim 90 (Previously presented): The method of claim 89 wherein deflecting the laser energy off of a chamfered end of the optical fiber located in the expansion zone comprises deflecting the laser energy off of an end of the optical fiber chamfered on the order of 45 degrees.

Claim 91 (Previously presented): The method of claim 89 wherein deflecting the laser energy off of a chamfered end of the optical fiber located in the expansion zone comprises deflecting the laser energy off of a chamfered end of the optical fiber having a coating that reflects light at two different wavelengths.

Claim 92 (Previously presented): The method of claim 79 further comprising receiving data from a temperature sensor located at the distal end of the probe.

Claim 93 (Previously presented): The method of claim 79 further comprising receiving data from a temperature sensor mounted on the inside surface of the outer wall of the probe proximate the distal end.

Claim 94 (Previously presented): The method of claim 79 further comprising controlling a temperature at the distal end of the probe by varying the pressure of the fluid directed to the expansion zone in the distal end of the probe.

Claim 95 (Previously presented): The method of claim 79 wherein heating the volume by directing laser energy through the probe and out the distal end of the probe into the volume comprises directing laser energy through an optical fiber extending through an outer tube of the probe and into a transparent capsule distal of the outer tube and enclosing a distal end of the outer tube.